TAPInternational

Capital Construction Contract Change Order Management and Administration: Opportunities Identified to Strengthen Processes and Oversight Structure

Final Report of the Independent Auditor for the Santa Clara Valley Water District Board of Directors

January 30, 2020

TAPInternational

Date: **January 30, 2020**

Memorandum For: **Board Audit Committee**

From: **Independent Auditor, TAP International, Inc.**

Subject: **Transmittal of TAP International Performance Audit Report**

Attached for your information is our draft report, *Construction Contract Change Order Management and Administration: Opportunities Identified to Strengthen Processes and Oversight Structure.* The audit objective was to determine if potential improvement opportunities are present in the construction change order process.

The audit report describes opportunities to strengthen change order management and administration for large-scale capital construction projects. These opportunities include enhancing constructability reviews, requesting third party and independent cost estimates, and utilizing an advisory body to review and approve change orders. Valley Water can also centralize change order management and administration by establishing a Resources Services Office that would provide comprehensive administrative, project design, and construction management support for large-scale capital improvement projects, including information sharing and other services on other smaller construction projects. This audit report contains seven recommendations. See Appendix I of this report for management's response to each of the recommendations.

TAP International, Inc.

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Section I: Results in Brief

Why the Audit Was Conducted

Efficient and effective service and delivery are key priorities for the Santa Clara Valley Water District (Valley Water) to accomplish the goals of providing safe and clean water, environmental stewardship, and flood protection. Valley Water plans to contract with construction companies to complete 67 capital improvement projects over the next 15 years for about $5.158B.[1] These projects include large construction projects involving the Anderson Dam seismic retrofit and the Pacheco Reservoir expansion. Any changes to these contracted capital projects present a risk of cost overruns and schedule delays.

With the approval of the Valley Water's Board of Directors (Board), a performance audit was conducted by the Independent Auditor for the Board of Valley Water's capital construction contract change order process to identify, if any, the presence of potential improvements.

How the Audit Was Conducted

The capital construction contract change order performance audit included an examination of organizational structures, division, unit and employee roles and responsibilities, information collection and sharing, and policies and procedures. The completed audit work included: (1) analysis of 12 completed capital construction projects between 2017 and 2018, with detailed file review of six of these contracts to examine how the change order process was administered by Valley Water management and staff; (2) comparison of Valley Water change order policies and procedures to leading practices; (3) interviews of Valley Water management and staff from the Water Utility Capital and Watersheds Design and Construction Divisions, Purchasing and Consultant Contracts Services Unit, Capital Program Planning and Analysis Unit, Valley Water Counsel, Capital Improvement Program (CIP) Committee officials, Valley Water contractors, and former Dispute Resolution Board (DRB) officials; and (4) implementation of root cause analysis to identify the primary reason(s) for change order initiation.

What the Audit Found

This audit report describes that, while Valley Water capital construction policies and procedures address many leading practices, opportunities are present to enhance change order management and administration activities for extremely large capital construction projects. Potential business process improvement opportunities include:

- enhancing existing change order policies and procedures to better align with leading practices,
- enhancing constructability reviews with third party experts,
- updating how contingency budgets are established, and
- ensuring uniform implementation of change order preparation and processing.

[1] Per the Fiscal Year 2020-2024 Capital Improvement Program. https://www.valleywater.org/sites/default/files/2019-05/CHAPTER%2001%20Overview_optimized.pdf.

These enhancements are necessary because the existing capital construction processes, which were generally established for smaller capital projects, do not fully mitigate the potential risks for change orders on large capital projects applicable to their need, frequency, and magnitude. Other concerns could also occur on large capital construction projects, such as implementing preliminary change orders on a time and material basis, allowing work to begin on change orders without the approval of a formal change order, and other activities that were implemented non-uniformly. These activities included documenting the causes of change orders and showing the results of pricing reviews.

Although the 32 change orders that we reviewed do not reflect the actual magnitude of changes occurring on projects, key stakeholders identified project planning and design activities as the leading factor driving change orders. TAP International's analysis on this issue further determined that the decentralized design of Valley Water's change order management and administration process does not routinely prevent the occurrence of gaps in project planning and design activities or ensure uniform implementation of change management policies and procedures.

TAP International also found that when project and construction management are performed internally, Valley Water delegates nearly all the responsibility for change order management and administration to individual employees to provide flexibility in meeting project schedules. These employees have varying levels of experience and knowledge in project management and execute other primary roles and responsibilities. With this type of model, key support structures are necessary to aid project and construction managers in carrying out change order management and administration.

TAP International determined that added support structures should include a separate advisory body to review and recommend the approval of change orders for large-scale projects. This body can include legal, procurement, capital construction experts, and management to monitor progress, including reviewing and recommending change order approval/non-approval. A new Resources Services Office (RSO) could also address the gaps with project and construction management knowledge among existing staff assigned to serve as managers. An RSO could allow project and construction managers more time to ensure project delivery by assuming responsibility for change order negotiation, pricing analysis, ensuring uniform implementation of the Quality Environment Management System (QEMS), and better reporting. Without additional support structures and better change order management and administration, Valley Water can expect to experience a high volume of change orders and inconsistent management of these change orders on large-scale capital construction projects.

Recommendations

To mitigate the potential service and financial risks created by the issuance of change orders on large-scale capital construction projects, we recommend that the Chief Executive Officer (CEO):

1. Update capital construction change order policies and procedures applicable to large-scale projects to:

    a. Require an Independent Cost Estimate (ICE) for capital construction change orders.
    b. Use a separate advisory body to review and recommend the approval of change orders.
    c. Prohibit commencement of work until after formal approval of the change order.

2. Enhance constructability reviews as part of the construction project design phase with the addition of independent subject matter experts to the review team to help mitigate the occurrence of change orders on large-scale capital projects.

3. Enhance the review and approval process for change orders (including potential change orders, contract change orders, and directed change orders) on capital construction projects that are new to Valley Water and/or whose project costs exceed a specific level established by the CEO (i.e., $100M) to add and enhance support structures to aid project and construction managers in capital project delivery. An option could include:

    a. Create a Capital Project Steering Committee for each new project to review project progress and provide authority to review and approve change orders. The Committee should include Valley Water management, project, and construction manager, external subject matter experts, outsourced legal construction contract counsel, and a representative from the Purchasing and Consulting Contracts Services Unit.

4. Create a Resources Services Office (RSO) or restructure the current Capital Program Planning and Analysis Unit and develop RSO roles and responsibilities, including the business processes and information systems needed to support large-scale capital construction projects and to serve as a resource for project and construction managers on smaller projects. Examples of expected RSO roles and responsibilities for large-scale capital construction projects include:

    - Integrate project design and construction management activities;
    - Develop large-scale construction management policies and procedures;
    - Ensure consistent and uniform implementation of capital project management and construction management standards;
    - Manage and administer the contract management and change order process;
    - Consolidate, analyze, and disseminate lessons learned activities and historical project information for future project planning;
    - Coordinate project and construction project activities;
    - Establish and manage project and construction management standardization;
    - Implement a centralized project management information system;
    - Enhance QEMS activities, including the preparation and updating of guidelines and checklists to be used by project and construction managers;

- Prepare information about the reality of existing projects and corrective action plan development;
- Promote continuous process improvement;
- Establish a performance-based management system to track effective change order management, project completion, and project financial performance.

Examples of RSO roles and responsibilities for smaller capital construction projects would be to share historical project information to support design activities and to assist project and construction managers on change order negotiation.

5. Transfer the responsibility to administer procurement activities on capital projects (e.g., request for bid preparation and bid processing) from the Capital Program Planning and Analysis Unit to Valley Water's Purchasing and Consultant Contracts Services Unit to centralize procurement activities. The RSO should assume responsibility for contract administration and change order management on all capital projects upon execution of the contract by the Purchasing and Consultant Contracts Services Unit. For example, the Purchasing and Consultant Contracts Services Unit can embed an employee into the RSO. This employee could oversee change order management, administer an oversight role in coordinating updated change order policies and procedures, and/or conduct spot audits to ensure change orders comply with contractual terms and conditions.

6. Promote the uniform implementation of change order management and administration for all capital projects by:

    a. Developing and establishing specific criteria for establishing contingency budgets for change orders that consider project complexity and size (Example: $0 contingency for capital projects less than $100,000 ranging to an amount over $1M for projects over $500M) eliminating the need for the Board of Directors to approve contingency budgets for each capital construction contract separately.

    b. Updating the Quality and Environmental Management System (QEMS) forms to:
        - Develop templates within the Capital Improvement Program Planning document to provide clarification on how Quality Records should be completed.
        - Add a step in the Close-Out Checklist for the review of open change orders and potential change orders.
        - Enhance the Risk Management Process document to include a review of similar projects in the Capital Improvement Program Historical Information Retrieval (CIPHIR) tool to identify additional project risks and corrective actions that may not have been previously identified.

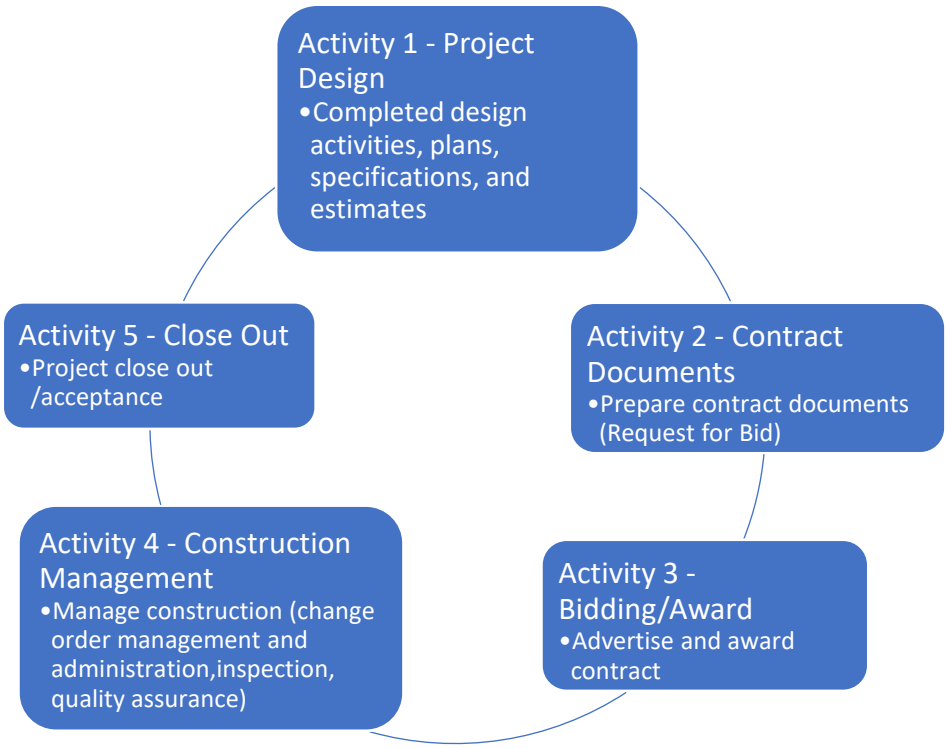
    c. Enhance project management training to address change order management and administration, including negotiation, pricing analysis, and contract closeout activities.

7. Develop, track, and report on performance metrics that monitor the timeliness, costs, and cost savings on large scale capital projects. Metrics established for monitoring the final capital project closeout costs against the original base contract amount should exclude contingency budget amounts.

Section II: Background

Over the next 15 years, the total estimate for construction contracts to be awarded is approximately $5.158 billion for capital improvement projects that improve, repair, replace, or construct infrastructure. Valley Water has 28 Water Supply projects, 19 projects to increase flood protection, 10 projects for environmental restoration, enhancement and mitigation projects, two projects to repair or maintain Valley Water buildings and grounds, and eight projects to upgrade or expand existing information technology.[2] To complete these capital improvement projects, Valley Water generally administers a capital project development to acceptance process. Figure 1 illustrates a commonly used capital project design and construction management cycle.

Figure 1. Capital Construction Project Development to Acceptance Process[3]



What is a Change Order?

Capital project design and construction management processes include change order management and administration. A construction contract change order, according to established industry definitions, is a written alteration that is issued to modify or amend a contract or purchase order. It can be a bilateral request (agreed to by all parties or a unilateral request (the public agency orders a contract change without the consent of the contractor). For construction contracts, the primary

[2] Per the Fiscal Year 2020-2024 Capital Improvement Program. https://www.valleywater.org/sites/default/files/2019-05/CHAPTER%2001%20Overview_optimized.pdf

[3] Illustrates key leading practices and not Valley Water's processes.

reason for a change order is the unanticipated conditions encountered during construction that were not covered by the drawings, plans, or specifications of the project. Change orders at Valley Water can result in modifications to the established project specifications, schedule, cost, or scope of work, among other things.

Valley Water has three distinct types of construction-related change orders that can modify the original contract, which will be referred to as change orders throughout this report. The various change orders include:

- potential change orders (PCO) (project issues that can lead to a contract change order),
- directed change orders (unilateral change directed to the contractor by Valley Water),
- contract change orders (changes agreed to by all parties).

Who Can Initiate a Construction Contract Change Order?

Change orders can be initiated by Valley Water or at the request of contractors. In some cases, potential project issues can be prevented and disagreement over contractual terms or change orders resolved by using a Dispute Resolution Board (DRB). Each construction contract specifies whether a DRB will be used for the project and how the costs of the DRB will be shared between Valley Water and the contractor.

What is the Difference Between a Construction Contract Change Order and a Professional Services Agreement Amendment at Valley Water?

Contract change orders refer to changes that take place on construction contracts between Valley Water and companies involved in the construction of the capital project. These changes, such as schedule updates, costs, specification changes, the scope of work expansions, and unanticipated changes, are reflected in separate change order forms. Modification to the original base contract does not generally take place except for modifications to certain terms and/or conditions. Valley Water Counsel and the Purchasing and Consultant Contracts Services Unit do not have a formal role in the review of change orders.

Similarly, amendments to a Professional Services Agreement refer to changes that take place on base contracts for services provided to Valley Water. These services include project management services, engineering design services, staffing services, media services, and more. Amendments made directly on professional services contracts address all types of changes, such as modifications to completion dates, price, and scope of work as well as changes to staffing and terms and conditions. Valley Water Counsel and the Purchasing and Consultant Contracts Services Unit have a formal role in the review of amendments to professional service agreements.

Audit Objective

In 2018, Valley Water's Independent Auditor (TAP International, Inc.) conducted an enterprise-wide audit risk assessment and identified construction contract change orders as an area that needed a further review to ensure that the capital construction change order process (change order process) is administered efficiently and effectively.

Our specific audit objective for this audit was to determine if potential improvement opportunities are present in the change order process.

Scope of Work

The scope of this audit included an evaluation of the change order process for construction contracts completed between 2017 and 2018. The work focused on the Watersheds Design and Construction Division as well as the Water Utility Capital Division.

Project Approach

To assess whether potential improvement opportunities are present in the change order process, TAP International performed the following activities:

- Examined change order policies and procedures against leading practices for construction contract management applicable to change orders. Leading practices were gathered from the following sources:

  - Capital construction subject matter experts (Water and general construction contractors).
  - Federal Transit Administration's Best Practices Procurement Manual.
  - Washington State Department of Transportation - Construction Contract Order Process Guide.
  - Oregon Department of Transportation - Construction Manual.
  - Federal Acquisition Regulations (FAR 43.1 - General, subpart 43.2 Change Orders).
  - TAP International experience in examining capital construction programs in other public agencies.

  The change order practices selected apply to general construction management business processes regardless of the type of industry, such as water, transportation or general construction. These business processes include preparation of, review and approval, and close-out of change orders.

- Reviewed all construction contracts completed between 2017 and 2018 (12) and related change orders to determine the frequency of change orders issued and the financial impact on the original contract. These 12 completed projects were:

  - Boardroom Audiovisual Modernization Project;
  - Installation of Cathodic Protection Rectifiers and Deep Well Anodes on Santa Clara Conduit;
  - Installation of Cathodic Protection Rectifies and Deep-Well Anodes on the Pacheco Conduit;
  - Matadero Creek Sediment Removal & Erosion Repair and San Tomas Aquino Creek Erosion Repair Project;
  - Almaden Valley Pipeline Carbon Fiber Reinforced Polymer Structural Repair Project;

- El Camino Storm Drain Erosion Repair Project;
- John D. Morgan Park Monitoring Wells Project;
- Pacheco Conduit & Rehabilitation Project;
- Fluoridation at WTP's;
- IRP2 Water Treatment Plant Operations Buildings Seismic Retrofit Project - PWTP and the PWTP Clearwell Recoat and Repair Project;
- Lower Berryessa Creek Project Phase 1;
- Penitencia Delivery Main and Penitencia Force Main Seismic Retrofit Project.

➢ Examined six construction contracts for:

- Change order review and authorization activities. For the six contracts, we examined the two formal documents used in the change order approval process identified by staff: the change order form (FC 207) and the Board Agenda Memorandum for Completion and Acceptance of each contract. We examined the Change Order form (FC 207) because it is used to obtain approvals from the project engineer up to the CEO for change orders that do not exceed the dollar value of the project contingency (and would require Board approval). The Board Agenda Memorandum for Completion and Acceptance was also used because it is a key approval document for the Board of Directors.
- Pricing review and approval.
- Nature of the change orders.
- The time required to process the change order.

The six contracts subject to this review were:

- Installation of Cathodic Protection Rectifiers and Deep Well Anodes on Santa Clara Conduit;
- Installation of Cathodic Protection Rectifiers and Deep-Well Anodes on the Pacheco Conduit;
- IRP2 Water Treatment Plant Operations Buildings Seismic Retrofit Project - PWTP and the PWTP Clearwell Recoat and Repair Project;
- Penitencia Delivery Main and Penitencia Force Main Seismic Retrofit;
- Matadero Creek Sediment Removal & Erosion Repair and San Tomas Aquino Creek Erosion Repair Project;
- Lower Berryessa Creek Project Phase 1.

➢ Interviewed Valley Water management and staff involved with procurement, project design and implementation of the construction contracts, project support, and financial management to discuss how change orders are processed, reviewed, approved, and monitored. Staff from the Dam Safety and Capital Delivery Division participated in these interviews.

- Examined Quality and Environmental Management System (QEMS) use in the capital construction change order management process.
- Evaluated review and approval activities for capital construction change orders based on interviews with members of the Capital Improvement Project (CIP) Committee, Valley Water management and staff, and former DRB members.
- Performed a root cause analysis focused on the initiation of change orders. For this, we completed a qualitative analysis because documentation was not consistently prepared to conduct a quantitative analysis of root causes. TAP International interviewed Valley Water management, construction and project managers, contractors, former Dispute Resolution Board (DRB) members, and considered the results of our evaluation of Valley Water's capital construction change order management and administration.

This audit was conducted as a performance audit. A performance audit evaluates the economy, efficiency, and effectiveness of programs, services, and operations. This performance audit was conducted in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. TAP International believes that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives. A draft report was provided to Valley Water for review. Comments were incorporated as applicable throughout the report. See Appendix 1 for formal agency comments to the recommendations included in this report.

Section III: Key Findings

Finding 1: Opportunities are Present to Better Align Valley Water Change Order Management and Administration to Leading Practices

Policies and Procedures Help Mitigate the Risks Presented by Change Orders

Large-scale capital construction projects generally have a higher inherent risk because of their size and complexity. Key risks include implementing unnecessary change orders, unauthorized change orders, or over-priced change orders. Other risks include significantly changing the nature of the project, changing the original scope of work specifications without appropriate justification, and not ensuring change order requirements were properly monitored through completion. These risks can significantly impact the cost, quality, or time to complete the project. For agencies to mitigate the risks associated with change orders, their policies and procedures play a critical role.

Leading practices are industry-accepted practices and procedures recommended as most effective to enhance service delivery and to mitigate risks. TAP International identified that Valley Water's policies and procedures for the construction management change order process address many (22) leading practices, as shown in Table 1. Policies and procedures address change order pricing, contract modifications, pricing requirements, written justification, excluding from base contract contingency amounts, use of change order forms, description of change, use of unit pricing when appropriate, price review, storing of change order records, use of checklists, funds availability checking, review of contractor submitted change orders, price and schedule agreement, cost & technical proposal, contract scope review, use of delegated authority, use of contractor estimate, description of specification changes, timeframes for negotiation, excluding contingency budget from contract, and change order pricing stipulations.

Table 1: Leading Change Order Management Practices Administered by Valley Water

	Total Number (30)
Leading Practices Addressed or Partially Addressed in Policies and Procedures	22
Leading Practices Not Addressed in Policies and Procedures	8

Valley Water's change order policies and procedures do not address eight other leading practices. Policies and procedures do not address detailed documentation of negotiation, prohibit commencement of work prior to approval, use of a third-party advisory body, use of root cause analysis, use of Independent Cost Estimates (ICEs), documentation of cost analysis, written record of explanation of differences between negotiated price and ICE, and verification of assumptions supporting ICEs. Because Valley Water is transitioning into larger, more complex capital construction projects, some of these leading practices are needed to mitigate the potential risks that could result from implementing change orders. (e.g., unnecessary specifications, cost overruns, project delivery delays).

Potential to Add the Use of Independent Cost Estimates

Leading practices suggest the need for reviewing change orders with large cost adjustments against ICEs. The practice serves to determine if there are differences between the ICE and the contractor estimate. If a difference is present, then the basis for each estimate is discussed, which could prevent the overpricing of work. Although Valley Water's change order policies and procedures call for the review of contractor cost estimates, staff explained that ICEs were not needed because Valley Water has sufficient expertise from prior comparable projects to determine the appropriateness of cost estimates. Without ICEs, Valley Water must rely on the expertise and experience of the project manager or construction manager to discuss and negotiate differences in pricing. TAP International determined that some managers may not challenge contractor cost estimates because they do not have the depth of knowledge in comparison to more experienced project and construction managers.

Prohibit Commencement of Work Until Approval of Change Orders

As another example, leading practices suggest that construction work should not begin until change orders have been reviewed and approved. Valley Water's construction policies and procedures do not explicitly address this practice and expose Valley Water at higher financial risk. TAP International determined that on four of the six contracts, Valley Water allowed work to begin on multiple potential change orders (PCO), including beginning work on a time and materials basis until completion whereby Valley Water converts the PCO or combines multiple PCO(s) into a change order for formal review and approval. Table 2 below shows the formal approval of change orders after the final inspection, but before project completion. Project and construction managers explained that much of the capital project work is driven by seasonality that requires the opening of change orders as negotiations take place concurrently. Contractors reported that the process for developing project schedules should be reviewed as some project work is known to be delayed and should not have commenced until the following year. The known delays, if not addressed in the project schedules, create seasonal pressures that lead to change orders.

Table 2. Timing of Change Order Approval (Six Contracts Reviewed)

				When Change Orders were Approved			
Project Name	**Contract No. & Submittals**	**Division**	**Total Number of Change Orders**	**After Contract Award, Before Final Inspection**	**After Final Inspection, Before Project Completion**	**After Project Completion, Before Completion & Acceptance**	**After Completion & Acceptance**
Installation of Cathodic Protection Rectifiers and Deep Well Anodes on the Santa Clara Conduit	C0632	Water Utility	2	2	0	0	0
Installation of Cathodic Protection Rectifiers and Deep-Well Anodes on the Pacheco Conduit	C0623	Water Utility	2	0	0	1	1*
IRP2 Water Treatment Plant Operations Buildings Seismic Retrofit Project- PWTP and the PWTP Clearwell Recoat and Repair Project	C0609	Water Utility	9	6	2	1	0
Penitencia Delivery Main and Penitencia Force Main Seismic Retrofit	C0611	Water Utility	18	13	5	0	0
Matadero Creek Sediment Removal & Erosion Repair and San Tomas Aquino Creek Erosion Repair Project	C0642	Watersheds	0	NA	NA	NA	NA
Lower Berryessa Creek Project Phase 1	C0604	Watersheds	3	1	0	2	0
	Totals	**All**	**34**	**22**	**7**	**4**	**1**

* One change order was processed after the Board approved the Notice of Completion and Acceptance for the contract because the Board had to increase the contract amount to pay for the change in work. This is contract 623, also discussed in another section of this analysis.

Establish Advisory Body to Support Change Order Management and Administration

Leading practices suggest that a headquarters construction office (or Change Control Board) review all construction change orders and (if appropriate) recommend for approval, which would enhance project oversight and accountability. Valley Water's construction policies and procedures do not address the use of a central body to oversee change orders. Instead, Valley Water implements delegated review and approval authority for change orders for both small and large-scale projects.

TAP International determined that the change order review and approval process can benefit from a different oversight process because the current process is not fully effective at mitigating potential risks, especially on large-scale projects. Presently, Valley Water relies on various individuals delegated to review and approve change orders from project and construction managers to the CEO, including requesting Board of Directors approval on some of them depending on the price of the change. However, Valley Water has not assigned responsibility and authority to one single body or unit within Valley Water to:

- conduct uniform review of change orders for compliance to contract terms and conditions;
- ensure the change order adheres to contractual terms and conditions as well as other procurement requirements;
- determine whether the proposed change is not within the scope of the statement of work;
- determine if the proposed change is within the scope of the statement of work in the base construction contract but has been modified already by a previously approved change order.

These compliance responsibilities fall on the project or construction manager. Counsel staff does not have a formal role in the review or approval of change orders, including those that change the specifications, cost, and/or schedule of the contract, but informal discussions do occur. District Counsel staff explained that change orders generally include technical specifications, which are best handled by the project or construction management staff although TAP International determined that change orders address a variety of circumstances that are discussed later in this report. The Purchasing and Consultant Contracts Services Unit does not have an informal or formal role.

In contrast, Valley Water has established a more formalized review process for amendments to the professional services agreement, which provide consulting services that include project management services, engineering design services, staffing services, media services, and more. Counsel staff reviews all prepared amendments resulting in suggested modifications and then returns the document to the Purchasing and Consultant Contracts Unit for updates. This process is cyclical, repeating multiple times spanning months before approval of the final draft of the amendment. The types of amendments that require CEO approval include schedule changes and other minor adjustments.

With some staff taking exception, project and construction managers agreed that changes to the authorization process might be needed for large capital projects and projects with scopes of work that are new to the District. These projects pose a greater potential financial and project delivery risk because Valley Water does not have prior project or construction management experience to anticipate project needs. For example, staff explained that even with a very small capital project that built a public restroom facility, it generated multiple change orders and additional costs because the agency had no prior experience with that type of project. Board officials and other construction experts also reported a need to implement stronger oversight for Valley Water's planned large-scale projects, explaining that by the time the change orders reach the Board of

Directors for approval, the project may be in completion phase, thus preventing any in-depth review or challenge of the change order.

Oversight mechanisms, such as an advisory body, could be able to closely review change orders for Valley Water's planned large-scale capital construction projects. The existing CIP Committee, comprised of Board members, can potentially provide change order reviews and recommend approval or denial by the full Board for high-risk capital improvement projects.[4] Key advantages of establishing a greater role of the CIP Committee in the review and approval of change orders include providing greater oversight of high-risk capital projects and streamlining the approval process for the Board of Directors. However, key disadvantages include ensuring that CIP members have sufficient knowledge of change order requirements, cost estimates, contract specifications, and capital construction project activities to provide effective oversight. While the current composition of the CIP Committee has elected Board Directors with requisite capital construction contract and legal experience, the composition of the Committee can change as future Board of Director elections are held, leaving the CIP Committee with gaps in knowledge and expertise. In addition, the CIP Committee would have to modify its meeting schedule to meet more frequently as well as determining whether to have a 3-day or 10-day agenda posting to ensure timely review and approval of construction change orders. Further, risks in politicizing change order decisions may be present without established decision-making criteria in place. Finally, having elected officials participate in the day to day operations may interfere with its oversight and monitoring responsibilities.

For these reasons, a new standing or a project-specific steering committee can be comprised of a Valley Water management and staff, outsourced legal counsel with expertise in capital construction, Purchasing and Consultant Contracts Services Unit staff, and independent construction industry experts to vet the change order and recommend approval to the Chief Operating Officer. Key advantages include providing third party oversight to evaluate and challenge construction contract change orders, more timely review and approval, and the capability of offering advisory services to project and construction management staff to help prevent issues that could require DRB resolution. While the DRB presently offers advisory services on some contracts, the Board composition includes only construction contract experts, and its use is not routine. A key disadvantage with implementing a project steering committee is the consulting costs involved with implementing a standing committee or ad-hoc committees for each high-risk capital construction project, but there could be a return on this investment if costly change orders can be prevented.

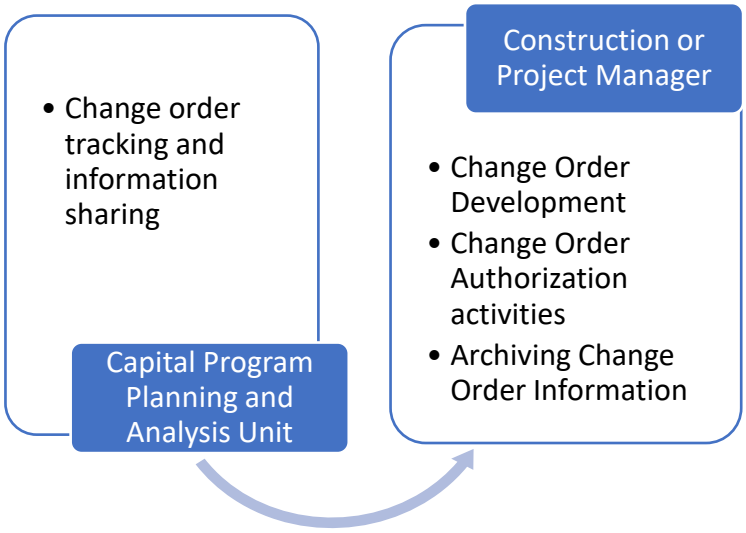
Centralization of Some Support Service Activities

Other public agencies with large capital construction programs utilize their procurement departments in preparing a request for proposals and requests for bid, including their issuance, receipt, bid evaluation, and award. Valley Water's Purchasing and Consultant Contracts Services Unit

[4] The CIP does not currently have the authority to approve and recommend approval of change orders by the Board of Directors.

does not have a role in Valley Water's construction procurement activities because another unit has long administered this role within the Water Utility Capital Division – the Capital Program Planning and Analysis Unit. Without a role by Purchasing and Consultant Contracts Services, Valley Water primarily relies on the Counsel's office to review the Notice to Bidders, which is attached to the Board Agenda Memorandum authorizing the bid; advertisement for bids; and the bid submittals. These activities should be the primary responsibility of the Purchasing and Consultant Contracts Services to ensure that staff is complying with state and federal procurement requirements. Valley Water staff further explained that the Capital Program Planning and Analysis Unit supports procurement activities because these activities are completed on a timelier basis in comparison to having the Purchasing and Consultant Contracts Services Unit assume responsibility. A Valley Water management official responsible for general administration explained that given the current changes within the Purchasing and Consultant Contracts Services Unit, timeliness risks can be mitigated and that capital construction procurement activities could be centralized to ensure proper adherence to contractual and other procurement requirements.

Current Primary Organizational Roles and Responsibilities – Construction Contract Change Orders



Leading practices describe the use of central management and administration of change orders on capital construction projects. The current Capital Program Planning and Analysis Unit serves more of a support role than a compliance role as it does not fully oversee the processing of change orders, which is the responsibility of the project manager and construction manager. Capital Program Planning and Analysis Unit staff capture information from change orders to track on worksheets, but it is not formally responsible for ensuring that change orders have all required documentation or ensuring that open preliminary change orders have been formally prepared. In addition, the Capital Program Planning and Analysis Unit are responsible for Request for Bid preparation, issuance, processing, and contract award; preparing information for the CIP Committee; tracking capital construction contracts; and collecting QEMS reports, among other things.

While project managers and construction managers did not report any significant concerns with the current structure of the Unit, TAP International identified areas for enhancement. The enhancements needed for better management of large-scale capital construction projects include:

- Establishment of a performance-based management system. While the Unit has the capability to monitor cost overruns, it includes the contingency budget amount in the

analysis, and it combines the contingency budget with the original contract amount to compute whether costs exceeded the total construction amount. Other public agencies with large construction programs exclude the contingency amount from the total construction budget to determine the level of cost overruns in comparison to the original budget. These agencies use the information to target potential changes in the change order process to prevent excess costs over the original contract amount. Analyzing the magnitude of cost overruns by comparing the total value of the change orders to the base contract amount allows public agencies to better assess overall financial performance on capital projects. For example, TAP International determined that of the 12 capital projects completed between 2017 and 2018, nine had cost overruns averaging $337,000, excluding contract contingency budget amounts. When factoring in the contingency budget, one of the 12 projects incurred a cost overrun.

- Development of analytics program to support design activities. The Capital Program Planning and Analysis Unit does not provide robust data analysis on the capital projects that would help project managers identify needed design changes on future projects. The Capital Program and Planning Analysis Unit generally use Excel databases to capture project history, but the data includes basic contract data that cannot be used to identify trends and patterns to prevent future issues on capital projects.

As an alternative to the Capital Program Planning and Analysis Unit or a hybrid version of it, public agencies that implement large-scale capital projects have an office that provides comprehensive support for project design and construction management activities, which this report refers to as a Resources Services Office (RSO). An RSO assumes responsibility for implementing capital projects in a standardized way by providing information to support decision-making and ensures that policies and procedures are consistently followed. The range of functions, which are not currently performed by the current Capital Program Planning and Analysis Unit can include:

- conducting analytics on historical projects to identify areas that need attention in planning future projects;
- consolidation and reporting of lessons learned information;
- ensuring uniformity and consistency in business processes over construction contracts; and,
- ensuring the accuracy of information and data reported to executive management.

Other activities that an RSO can assume responsibility for on large scale projects include:

- Establishing and managing project management and standardization through a centralized project management information system. Valley Water utilizes three separate systems;
- Enhancing QEMS activities;
- Development and updating of Valley Water's Construction Manual;
- Preparation of information about the reality of existing projects and corrective action plan development;
- Preparation and updating of guidelines and checklists to be used by project and construction managers;

- Promoting continuous process improvement;
- Establishing a performance-based management system to track effective change order management, project completion, and project financial performance;
- Establishing and implementing risk management principles for identifying capital construction project risks, performing risk analysis, and developing response plans; and,
- Implementing change order management and administration.

Presently, Valley Water decentralizes many of the above activities to the project manager or construction manager level for large scale projects. Establishing a centralized RSO will promote consistency among projects and the sharing of project information. At a very basic level, the RSO supports the project and construction management teams by facilitating information sharing, conducting analytics, seeking funding, and resourcing. Leading practices show that RSOs can offer:

- **Governance** - The RSO ensures that decisions are made by the right people, based on accurate information. The governance role can also include audits or peer reviews, developing project and program structures, and ensuring accountability at all levels.
- **Transparency** - The RSO is responsible for providing information and being the single source of data. Information needs to be relevant and accurate to support effective decision-making and provided to people in a way they can understand.
- **Reusability** - The RSO facilitates the sharing of knowledge for the purpose of preventing project teams from reinventing the wheel, making the RSO the central point for lessons learned, templates, and best practice.

Finding 2: Change Order Management and Administration Needs Uniform Implementation or Other Enhancements

Official Forms Should Capture Reasons for the Changes

Of the six contracts reviewed, Valley Water processed 34 change orders across the six contracts completed between 2017 and 2018. These 34 change orders do not reflect the actual quantity of changes implemented on the contracts because TAP International identified another 110 individual change orders in the form of authorized PCO's that took place across the six projects.

Although Valley Water maintains information on the specific nature of the change in individual project files or across three different information systems, TAP International could not quantify the reasons for the change orders because formal documentation required for change order initiation, review and approval did not consistently or clearly document the reason for the requested change or related justification. The form used by staff for initiating a change order (form FC 207) does not require the reason for a change to be documented. Form FC 207 is the official form used by the project and construction manager to obtain approval for change orders.

TAP International examined the documentation presented to the Board at the completion of a construction contract for review of the staff-approved change orders. In the six contracts we reviewed, we found that the Board Agenda Memorandums seeking authorization of a Notice of Completion of Contract and Acceptance of Work and Recommendation of Construction Contract Acceptance did not consistently or clearly describe the reasons for change orders approved by staff. For example, four contracts (632, 623, 609, 611) cited "unforeseen" site circumstances or conditions as one of the reasons for changes in the work across the change orders to each respective contract. Valley Water staff differentiated between Valley Water-requested changes and post-design clarifications in the Board Memo for one contract (609), but in another contract (611) grouped these two categories as the reason for the changes. Another contract (604) grouped Valley Water-requested and Contractor-requested changes as the reason. Finally, one contract (604) stated that "issues" were the reason for the change orders. Another category used in two contracts (611, 642) cited "unused supplemental bid items" as the reason for the changes but did not explain why these items went unused. A Valley Water management official explained that while project files or information systems capture the specific reason for the change, the information is not consolidated for reporting purposes. Without having information about the reason(s) and justification for the change documented on the change order itself or informal documentation provided to the Board, it raises transparency concerns about the status of the capital project, how available funds were spent, if cost reductions occurred, and how well Board of Director expectations for project and service delivery were met.

Final and Balancing Change Orders Need Consistent Preparation

Valley Water's Construction Manual (Section 9, Change Orders) requires the Construction Manager to prepare a "final and balancing" change order designed to reconcile all change orders for the contract, and that this final change order accompanies the "Notice of Completion and Acceptance" of the contract to the Valley Water Board for approval. TAP International determined that although staff may implement this policy on other contracts, this practice was not implemented on the six contracts that we reviewed. Instead, Valley Water staff appear to use the Board Agenda Memorandum to transmit this information, instead of a required formal change order, to accompany the "Notice of Completion of Contract and Acceptance of Work" and "Recommendation of Construction Contract Acceptance" to the Valley Water Board for approval. This information helps the Board of Directors determine if the project was delivered in accordance with the financial terms of the contract, which takes on greater importance for large scale capital projects. Valley Water staff confirmed that its current practice is to prepare a summary of all changes and their amounts and their final contract amount at the time of Notice of Contract Completion and Acceptance of Work. Valley Water staff also acknowledged that the Construction Manual requires an update.

Contingency Budget Development Should Consider Potential Risks

Valley Water establishes contingency budgets on most construction contracts to fund the cost of change orders. Although Valley Water does not have written policies and procedures in place that guide contingency budget development, project managers commonly apply 10 percent or 15 percent of the contract value (see Table 3) with limited consideration of risk factors. Based on our sample of contracts, TAP International determined that Valley Water establishes contingency budgets that are 10 percent of the contract amount for higher dollar value projects and 15 percent of the contract value for lower dollar value projects. Staff stated that where additional construction risks and complexities are known, higher contingency budgets are established.

Other public agencies have taken different approaches that consider capital project size and complexity risk factors. For example, some agencies establish a range of contingency budgets in that capital contracts valued up to $25M have contingency budgets of $500,000, and capital contracts valued over $500M have contingency budgets of up to $1.2M.

Table 3. Award and Contingency Amounts for the Six Contracts Reviewed*

Project Name	Contract No.	Division	Award Amount	Contingency Amount	Contingency %
Installation of Cathodic Protection Rectifiers and Deep Well Anodes on the Santa Clara Conduit	C0632	Water Utility	$ 244,400	$ 36,600	15%
Installation of Cathodic Protection Rectifiers and Deep-Well Anodes on the Pacheco Conduit	C0623	Water Utility	$ 291,740	$ 43,761	15%
IRP2 Water Treatment Plant Operations Buildings Seismic Retrofit Project- PWTP and the PWTP Clearwell Recoat and Repair Project	C0609	Water Utility	$ 6,072,500	$ 910,875	15%
Penitencia Delivery Main and Penitencia Force Main Seismic Retrofit	C0611	Water Utility	$ 21,535,025	$ 2,153,500	10%
Matadero Creek Sediment Removal & Erosion Repair and San Tomas Aquino Creek Erosion Repair Project	C0642	Watersheds**	$ 1,650,750	$ 165,075	10%
Lower Berryessa Creek Project Phase 1	C0604	Watersheds**	$ 12,186,600	$ 1,219,000	10%

*Valley Water does not have a written policy that establishes the basis to use in establishing a contingency budget.

**Construction management was outsourced.

While contingency budgets are disclosed separately in Board memos and approved by the Board of Directors for each capital construction contract, this practice allows Contractors to know early on the amount of potential revenue that could be earned on the contract from change orders. When this occurs, Contractors may be more prone to propose activities that could increase project costs – a potential financial risk to Valley Water. Valley Water executives explained that disclosure of the contingency budget allows the Board of Directors to know the level of funding dedicated within their representational zone. Other agencies do not establish contingency budgets and instead require governing body review and approval of each change or allow the contingency budgets for unforeseen circumstances only.

Delegation of Review and Approval Authority of Change Orders Needs Consistency

Each capital contract has a financial threshold established that delegates review and approval authority of change orders. These authorization thresholds can vary from project to project. Valley Water's CEO (or designee) can approve change orders up to the dollar amount of the contingency budget. Valley Water used dollar amounts as thresholds, rather than percentages, to set staff-

delegated approval authorities for change orders, which adds greater complexity to change order management, as shown in Table 4. For two Water Utility Capital Division contracts, the Engineering Unit Manager and Deputy Operating Officer had approval authority for changes valued up to $5,000 and $10,000, respectively. For two other Water Utility Capital Division contracts, the Engineering Unit Manager and Deputy Operating Officer were authorized to approve changes up to $100,000 and $250,000, respectively. For two Watersheds Design and Construction Division contracts, with construction management outsourced, for example, the Board authorized Deputy Operating Officer approval of contract changes for one contract up to $50,000, while on the other contract, authorized changes up to the contingency amount of $165,000. Streamlining the financial thresholds for delegated review and authorization facilitates the effectiveness of service delivery.

Table 4. Comparison of Change Order Approval Thresholds for the Six Contracts Reviewed

Contact Name	Contract No. & Submittals	Division	Contract Award Amount	Contingency Amount	Contingency %	Approval Thresholds
Installation of Cathodic Protection Rectifiers and Deep Well Anodes on the Santa Clara Conduit	C0632	Water Utility Capital	$244,400	$36,600	15%	EUM* $5K and DOO* $10K
Installation of Cathodic Protection Rectifiers and Deep-Well Anodes on the Pacheco Conduit	C0623	Water Utility Capital	$291,740	$43,761	15%	EUM $5K and DOO $10K
IRP2 Water Treatment Plant Operations Buildings Seismic Retrofit Project-PWTP and the PWTP Clearwell Recoat and Repair Project	C0609	Water Utility Capital	$6,072,500	$910,875	15%	EUM $100K and DOO $250K

Contact Name	Contract No. & Submittals	Division	Contract Award Amount	Contingency Amount	Contingency %	Approval Thresholds

Penitencia Delivery Main and Penitencia Force Main Seismic Retrofit	C0611	Water Utility Capital	$21,535,025	$2,153,500	10%	EUM $100K and DOO $250K
Matadero Creek Sediment Removal & Erosion Repair and San Tomas Aquino Creek Erosion Repair Project	C0642	Watersheds Design & Construction	$1,650,750	$165,075	10%	EUM $50K and DOO up to contingency amount
Lower Berryessa Creek Project Phase 1	C0604	Watersheds Design & Construction	$12,186,600	$1,219,000	10%	EUM $30K and DOO $50K

*EUM – Engineering Unit Manager; DOO -Deputy Operating Officer.

Cost Reductions on Capital Projects Should be Consistently Processed Through Change Orders

Valley Water change order procedures require the issuance of change orders to reflect cost reductions in the capital project. These change orders can then be used by Valley Water's Budget & Financial Analysis Unit to modify the budget information in the financial management system.

TAP International determined that Valley Water uses change orders inconsistently to document changes that resulted in cost reductions/savings. On three of the six construction contracts (604, 611, 642), five change orders were processed with cost savings for these three contracts, including both Water Utility Capital and Watersheds Design and Construction Division contracts. For contract 604 (Lower Berryessa Creek, Phase 1), the Watersheds Design and Construction Division project management staff reported about $1.2 million in cost savings across the three change orders[5]. Further, in change order #15 for Water Utility Capital Division contract 611 (Penitencia Force Main Seismic Retrofit), a change order documented a cost reduction of $135,025 from the deletion of Supplemental Bid Items in their entirety because naturally occurring asbestos was not encountered on the project.

In contrast, Valley Water did not issue a change order for cost reductions on Watersheds Design and Construction Division contract for Matadero Creek Sediment Removal & Erosion Repair and San Tomas Aquino Creek Erosion Repair Project (contract 642). It is unclear how Valley Water staff otherwise formally documented changes in the project files given that Valley Water outsourced construction management for this contract. The Board Agenda Memorandum for the Notice of Completion and Acceptance for contract 642 states there were no change orders, but that there was a cost reduction to the contract in the amount of $219,810, as shown in Table 5. The Board

[5] Valley Water had outsourced construction management on this contract.

Memo for contract 642 stated that "Various cost reduction for quantity adjustments attributed by value engineering; non-implementation of supplemental bid items such as winterization, resulted in a net savings amount of $219,810.00 less than the original contract award amount." When change orders are not consistently issued for cost reductions, management cannot easily track the amount of funds available that could be expended for other purposes.

Table 5: Board Memo Showing Cost Reductions Without a Change Order (Board Agenda Memorandum, File #19-0208)

Description	Contract Amount	Contingency Amount
Original Contract (Board Approved)	$1,650,750	$1,650,750
Cost Reduction Net Savings	<$219,810>	$1,650,750
Final Contract Amount and Remaining Contingency	$1,430,940	$1,650,750

Separating Change Orders to Retain Staff Approval Authority Should be Avoided

Valley Water assumes financial risk when multiple change orders are issued to likely avoid triggering an additional layer of review. For Water Utility Capital contract #623, Valley Water staff used two separate change orders to reflect cost increases. The split allowed Valley Water staff to use the approval authorizations established when the Board of Directors approved the contract. The Board had initially authorized the CEO to approve up to $43,761 in changes (a 15% contingency) for the almost $292K project.

The first change order was approved for a $40,000 "lump sum" for "hard rock drilling" at four well locations "to address an unforeseen condition." The change order also states that:

> "*The additional cost of $34,643.40 for disposal associated with the hard rock drilling requested*" by the contractor "*will be deferred and subject to action by the Valley Water's Board of Directors. Valley Water staff will recommend the Board approve an increase in delegated change order authority for the requested amount of $34,643.40 for disposal costs. If approved, a final change order will be submitted in that amount.*"

Valley Water executed the second change order about one month after the Valley Water Board approved the Completion and Acceptance of the contract, with an increase of about $31,000 to the contract's contingency to pay for the second change order.[6]

While Valley Water management staff explained the change orders were prepared for two separate issues (increase in delegated approval authority and to approve a change order), the discussion

[6] Approval of the first change order (6/11/2018) occurred after the Final Inspection (5/25/2018) and Projection Completion (6/5/2018) and Recommendation to the Board for Completion and Acceptance of the Contract (6/8/2018). The CEO approved the second change order on 7/18/18.

acknowledged that in hindsight, that the order and sequence in which the change orders were processed would have been managed differently if Construction Services Unit staff had performed the construction management on the project. TAP International determined that the two change orders should have been combined. When the second change order was issued, it was too late for the Board of Directors to perform an in-depth review of the change order, if needed.

QEMS System Can Be Expanded and Enhanced

Valley Water implements the Quality Environment Manager System (QEMS) with the goal of accomplishing organizational excellence and environmental stewardship. The QEMS conforms to International Organization for Standardization (ISO), allows Valley Water to support continual improvement activities through developing employee knowledge, establishing controls and activities for products, services, and good practices, and helping to make Valley Water more efficient and effective. To this end, Valley Water requires project and construction managers to complete standardized checklists and other forms to help ensure quality assurance over program and services.

TAP International identified the current QEMS forms used in the design and construction phases could be enhanced and better utilized. While the QEMS forms and other documents provide general procedures to mitigate capital projects risks, potential improvement to form enhancement include:

1. **Incorporate existing District practices onto QEMS project reports**. QEMS document titled, *Capital Improvement Program Planning (Q710D01)* establishes Valley Water's goal to instill a discipline of systematic planning for CIP projects. The procedure outlines the process steps for the CIP. For many of the steps, however, the Quality Records (Outputs from Process Steps) are not always defined and could be clarified by using links to templates or document examples.

2. **Enhance the Close-Out Checklist by including a review of open COs and PCOs.** QEMS document number *F-751-098* (Close-Out Checklist) is a form to create the Close-Out Report for each phase and final close-out of a project. With the coordination of the project owner, Capital Program Planning and Analysis Unit, and the General Accounting Unit, a review of all PCOs and COs that may still be open should be conducted so that the orders can be closed. This form can be updated to have an RSO type of office responsible for managing and processing open change orders.

   The Close-Out Checklist also defines what information will be needed from the Capital Improvement Projects Historical Information Retrieval (CIPHIR) system to develop the CIPHIR report. The CIPHIR is a tool designed to provide critical information regarding previous and existing capital projects. The CIPHIR Project Status Report should include a section related to lessons learned on the project specifically related to project changes that resulted in change orders. Having this information systematically reported can institutionalize continuous improvement process activities. TAP International identified the inconsistent implementation of historical reviews of past projects to facilitate project planning because project files are not centrally collected and stored for easy access by staff.

In addition, TAP International determined that historical change order information that could be useful in planning comparable projects is not systematically collected or analyzed for project planning purposes because the Capital Program Planning and Analysis Unit is not fully set up to perform this activity. Lessons learned information is maintained by the project manager for individual capital projects. Although Water Utility Capital and Watersheds Design and Construction staff acknowledge the value of having lessons learned activities, the Divisions do not institutionalize outcomes for consistent adaptation on future projects.

3. **Consistently implement document Q-751-013 (Capital Project Delivery).** Capital project delivery forms provide instruction to unit managers, project managers, and project team members on how to manage the delivery of capital projects. Step 3 (Plan Planning Phase), Step 6 (Plan Design Phase), and Step 9 (Plan Construction Phase) requires the review of information in the CIPHIR tool. This step is important but TAP International identified that project management practices vary by person and that each project is managed differently based upon the knowledge and experience of the manager.

4. **Clarify Section 11, Appendix A, (Q-751-013, Capital Project Delivery)**. Appendix A of Capital Project Delivery forms defines roles and responsibilities. TAP International identified that this section needs clarification because project managers are not always involved from project design to project completion, as stated. For some projects, project managers perform project planning, and upon completion of project design, another construction manager will assume responsibility for the project's implementation. For other projects, the project manager will remain assigned to the project from initiation to close-out.

5. **Enhance the Risk Management Process Document W-710-128.** This document provides instruction to unit managers, project managers, and project team members on how to identify, assess, and respond to risks in order to manage or reduce potential adverse effects on achieving project goals. Instructions address project risks, but do not require the identification of specific risks that reviewing the historical project documents of change orders may identify. Adding a step to have the project manager/risk owners review similar project information from the CIPHIR and describe specific corrective actions will also further enhance risk assessment in project planning.

Finding 3: Root Cause of Change Orders is Attributed to the Absence of Strong Support Systems

Root cause analysis (RCA) is a methodological technique designed to pinpoint the precise cause of an occurrence of a single or set of events or problems. When that cause is identified, solutions can be addressed to prevent re-occurrence. Root cause analysis for performance auditing relies on both quantitative and/or qualitative data collection and analysis methods. This method excludes the use of scientific investigation applied in other root cause analysis methods.

Although the information was not readily available on the reasons for change orders, Valley Water management and staff reported that change orders involve the:

- price of materials or labor;
- quantity of materials or labor;
- material specifications;
- project work schedule;
- scope of work;
- changes in environmental conditions;
- terms and conditions; and
- unforeseen circumstances.

Although TAP International could not perform a quantitative analysis of the root causes of change orders, our qualitative analysis determined that inconsistent implementation of project planning and design activities can be linked to change orders. For example, project and construction managers explained that one project planning activity includes reviewing past comparable projects for the types of challenges and other problems that occurred so that the issues could be resolved in the design phase of the new project. However, not all project managers said they perform this activity. Without anticipating the types of issues that occur when planning similar projects, change orders could likely result. Valley Water contractors reported that while some change orders result from unanticipated events, others result from permitting issues, jurisdiction coordination issues, and scheduling issues that could have been prevented had these issues been fully resolved in the planning phase. Finally, former DRB members for Valley Water identified ambiguities in the design of the project as the cause of change orders during their service as a representative on the DRB.

Project manager and construction managers further attributed the project planning and design activity concerns to different levels of expertise and experience by Valley Water staff. Project managers and construction managers who have experience working at other agencies said their greater level of experience and expertise empowers them to challenge contractors on requested project changes. Project managers and construction managers, who said they had less experience, cited the need for additional project management training to address gaps in their level of expertise, such as risk management, cost estimating, and negotiation. While Valley Water makes available project management training, management explained that it is staff responsibility to receive the training and staff, who have taken the training, said that more training is needed given that project and construction management is generally a secondary role and responsibility for Valley Water staff. TAP International determined that Valley Water does not require its capital construction staff to hold project management professional certifications, which may be needed on large scale projects. Possessing project management professional certification provides assurance that project and construction managers have received comprehensive project management training and have full knowledge of project management standards and practices.

TAP International determined that the likely root cause for change orders is the absence of strong support systems to aid project and construction managers. These support systems include:

- Enhanced oversight of the design process. DRB members said constructability reviews, conducted by experts independent of the design process, are an effective method to prevent change orders for both projects designed by Valley Water staff and projects designed by consultants;
- Robust project management training programs;
- Enhanced change order policies and procedures;
- Enhanced quality assurance forms; and,
- Utilization of an advisory body that would support decision-making on change orders.

Without the development of new and enhanced support systems, Valley Water can likely expect an increase of change orders on future capital construction projects.

Section IV: Acknowledgements

TAP International wishes to thank the staff who participated in this audit from the following divisions and units:

- Watersheds Design and Construction Division
- Water Utility Capital Division
- Construction Services Unit
- Dam Safety and Capital Delivery Division
- Purchasing and Consultant Contracts Services Unit
- Financial Planning and Management Services Division

Section V: Agency (Valley Water) Response to Audit Recommendations

RECOMMENDATION 1 - Update capital construction change order policies and procedures applicable to large-scale projects to: **a. Require an Independent Cost Estimate (ICE) for capital construction change orders.** **b. Use a separate advisory body to review and recommend the approval of change orders.** **c. Prohibit commencement of work until after formal approval of the change order.**	
a. AGENCY RESPONSE: Management agrees with this recommendation. Management will require an Independent Cost Estimate (ICE) for capital construction change orders on contracts greater than $100M or on projects of lesser value when the Chiefs deem the project to be higher risk. In addition, the services of an on-call cost estimator will be required for complex cost estimates, as determined by the Capital Engineering Manager overseeing the project based on an evaluation of in-house experience relative to the scope of work. **Target Implementation**: December 2020.	**INDEPENDENT AUDITOR'S RESPONSE**: a. Valley Water's response satisfies the recommendation.
b. AGENCY RESPONSE: Management agrees with the recommendation. A Change Control Board (CCB) will be established as part of a systemic change order management approach. The CCB will review changes that have a significant cost or schedule impacts. For large-scale projects, the addition of a Project Steering Committee will be established with project oversight to keep a pulse on progress or to address major design or construction changes. The Steering Committee would not replace the functions of the CCB but will review items of substantial interest as determined by the Steering Committee. Staff will develop processes and procedures for the CCB. The make-up of the CCB and Project Steering Committee will include senior and executive staff. Additional resources will provide input depending on the project issue under consideration, including the Engineer of Record, subject matter experts, legal counsel, and claims management and scheduling consultants. **Target Implementation**: December 2020	b. When staff develops procedures for the CCB, Valley Water should ensure that that the Change Control Board will review change orders on contracts valued at $100M or on projects of lesser value that are deemed to be high risk, to be consistent with Valley Water's prior response.
c. AGENCY RESPONSE: Management agrees with the recommendation. To responsibly and efficiently deal with changes, the responsibility and authority for change approvals	c. Valley Water could satisfy our recommendation and continue to provide autonomy to field personnel by allowing project managers/engineers the discretion to make changes to a project provided the changes can be implemented within the project's original budget. Delegating this

must be delegated to personnel at the level most knowledgeable and most closely aligned with the project issue. However, certain field changes that must be performed immediately to mitigate an emergency or to avoid critical, immediate delays to the project may necessitate force-account work to address the immediate need. Force account work (i.e., time and materials work) constitutes an approved change order of variable cost and duration while the scope of the change is finalized. **Target Implementation**: December 2020	authority then eliminates the need for a change order. Second, emergencies do happen, but even under the circumstances described by management, an expected budget for the work today's technology makes it possible for that budget to be quickly proposed, communicated, and approved in a very short period. A process for emergency work should be established.

RECOMMENDATION 2 - 2. Enhance constructability reviews as part of the construction project design phase with the addition of independent subject matter experts to the review team to help mitigate the occurrence of change orders on large-scale capital projects.	
AGENCY RESPONSE: Management agrees with the recommendation. Third-party and/or peer review processes will continue to be required for all large-scale projects to address constructability and identify risks and develop approaches to mitigate those risks. Staff will consider securing consultant services to provide third-party constructability reviews. **Target Implementation**: December 2020	**INDEPENDENT AUDITOR'S RESPONSE**: Our report affirmed that constructability reviews are being performed in-house by VW staff. However, CRB members said constructability reviews performed by independent third parties could further mitigate the need for change orders. We commend VW in their future efforts to consider consultant services for these constructability reviews. To ensure project transparency and predictability, staff should develop policies and procedures to identify the circumstances and other criteria that would trigger third-party constructability reviews, including the anticipated timelines and impacts on project design and delivery planning.

RECOMMENDATION 3 - Enhance the review and approval process for change orders (including potential change orders, contract change orders, and directed change orders) on capital construction projects that are new to Valley Water and/or whose project costs exceed a specific level established by the CEO (i.e., $100M) to add and enhance support structures to aid project and construction managers in capital project delivery. An option could include: **a. Create a Capital Project Steering Committee for each new project to review project progress and provide authority to review and approve change orders. The Committee should include Valley Water management, project, and construction manager, external subject matter experts, outsourced legal construction contract counsel, and a representative from the Purchasing and Consulting Contracts Services Unit.**	
AGENCY RESPONSE: Management agrees with the recommendation. The change-order approval process requires a review to ensure both processes and roles/responsibilities are clearly defined along with authority levels, which will be clarified in the revised process. The role of review and approval of change orders would be delegated to the CCB, with defined governance and procedures, including defined authority levels. Due to the unique and unexpected issues encountered by large projects, a Project Steering Committee would be established for projects greater than $100M. The Project Steering Committee will be established with project oversight to keep a pulse on progress or to address major design or construction changes. The Steering Committee would not replace the functions of the CCB but will review items of substantial interest as determined by the Steering Committee. Executive management will define the make-up and role of the Project Steering Committee. **Target Implementation**: July 2021.	**INDEPENDENT AUDITOR'S RESPONSE**: Valley Water's response satisfies the recommendation. The Independent Auditor continues to suggest that the Steering Committee includes external and outsourced personnel, which could help minimize financial and project delivery risks on large scale construction projects.

RECOMMENDATION 4 - Create a Resources Services Office (RSO) or restructure the current Capital Program Planning and Analysis Unit and develop RSO roles and responsibilities, including the business processes and information systems needed to support large-scale capital construction projects and to serve as a resource for project and construction managers on smaller projects. Examples of expected RSO roles and responsibilities for large-scale capital construction projects include:

- Integrate project design and construction management activities;
- Develop large-scale construction management policies and procedures;
- Ensure consistent and uniform implementation of capital project management and construction management standards;
- Manage and administer the contract management and change order process;
- Consolidate, analyze, and disseminate lessons learned activities and historical project information for future project planning;
- Coordinate project and construction project activities;
- Establish and manage project and construction management standardization;
- Implement a centralized project management information system;
- Enhance QEMS activities, including the preparation and updating of guidelines and checklists to be used by project and construction managers;
- Prepare information about the reality of existing projects and corrective action plan development;
- Promote continuous process improvement;
- Establish a performance-based management system to track effective change order management, project completion, and project financial performance.

Examples of RSO roles and responsibilities for smaller capital construction projects would be to share historical project information to support design activities and to assist project and construction managers on change order negotiation

AGENCY RESPONSE: Management agrees with the recommendation with the following exceptions. *All responses below will use the term "Project Controls Office", which is a more common term in project and construction management instead of "Resources Services Office".* **Management agrees with the recommendation**. The addition of the Project Controls Office will enhance Valley Water's ability to manage capital projects in a consistent manner, track and analyze historic change order trends, administer a robust lessons-learned program, and help develop a project management training program for capital project staff. Additionally, a Project Controls Office will provide project management staff the ability to focus on the details of the project. **Target Implementation**: July 2021 **Management does not agree with the recommendation that the Project Controls Office also be given certain design and construction management activities**. Project delivery and construction management activities should functionally be separate from the Project Controls	**INDEPENDENT AUDITOR'S RESPONSE:** The Independent Auditor commends Valley Water for its internal discussions to determine how better to deliver capital construction projects. Management raised two concerns about the recommendation that our response may be beneficial to these ongoing discussions. First, in the development of the recommendation by the Independent Auditor, stakeholders participating in the audit raised concern about the potential risk that use of the traditional name, "Project Controls Office (PCO)" will likely create a "silo" effect, meaning that the PCO would serve only the Capital Construction Division when there was need for an office to serve both Watershed and the Capital Construction Divisions. The Independent Auditor understands through subsequent discussions with VW staff that the agency has moved away from centralizing project

Office, yet monitoring of the project schedule, costs, and scope would be done for the lifetime (design and construction) of the project by the Project Controls Office. The Project Manager, assigned as the responsible person for the project, is tasked to integrate design and construction management activities from start to completion of the project – it is management's recommendation that this role should not be delegated to others, including the Project Controls Office. **Management does not agree with the recommendation that the Project Controls Office be given the responsibility to manage contract management and change order process**. The Project Manager is responsible for managing all aspects of the project. It is management's recommendation that the responsibility should not be assigned to a separate entity. Expected roles in the change management process are as follows: • The Project Manager and Construction Management staff manage contract change action and issue change orders, analyze and negotiate change orders, and prepare recommendations for contract changes to the Change Control Board. • The Project Controls Office reviews scope, schedule or budget changes as identified in the change order and interprets impact to the project, and coordinates change control functions (prep ERP, budget docs, schedule verification and impact analysis, etc.) • Construction management staff reviews preparation and negotiation of the change order to ensure compliance with contractual requirements, and reviews engineer's cost estimates and work statements to confirm the appropriate contract action. Staff will define the roles of project controls staff and define staffing levels for a new Project Controls Office.	support activities. While creating a PCO only within the Capital Construction Division will likely have a positive impact on Valley Water, the reach of this impact could be greater if the office could be shared by other Divisions that also manage projects like Watersheds. Second, as stated in the recommendation, the role of the Resources Services Office (RSO) is to help Valley Water "coordinate" and "standardize" project management activities across the District. As a unit providing only support services to project managers, the RSO would not assume any design or construction management activities. Our audit report described gaps in the support systems for VW project managers. Similarly, VW disagrees with having the RSO manage the contract and change management processes. The audit report described the need for a better contract and change order management because the processes, as currently implemented by project managers, create a high project and financial risks on large capital construction projects. The RSO could provide the <u>support</u> project managers need – and reduce the workload of project managers – by helping project managers to prepare change orders, track change orders ensure necessary approvals have been sought, and help to coordinate contract changes with the Procurement and Contracts Division.

RECOMMENDATION 5 - Transfer the responsibility to administer procurement activities on capital projects (e.g., request for bid preparation and bid processing) from the Capital Program Planning and Analysis Unit to Valley Water's Purchasing and Consultant Contracts Services Unit to centralize procurement activities. The RSO should assume responsibility for contract administration and change order management on all capital projects upon execution of the contract by the Purchasing and Consultant Contracts Services Unit. For example, the Purchasing and Consultant Contracts Services Unit can embed an employee into the RSO. This employee could oversee change order management, administer an oversight role in coordinating updated change order policies and procedures, and/or conduct spot audits to ensure change orders comply with contractual terms and conditions.	
AGENCY RESPONSE: Management agrees with the recommendation with the following exceptions. *All responses below will use the term "Project Controls Office", which is a more common term in project and construction management instead of "Resources Services Office".* **Management agrees** that procurement activities for capital construction contracts be transferred to the Purchasing and Contracts Unit. This recommendation has been executed. **Management does not agree** that the Project Controls Office would take responsibility for contract administration and change order management on all capital projects. Refer to the Management Response to Recommendation R4. **Target Implementation**: January 2020 transfer capital construction procurement activities to the Purchasing and Contracts Unit.	**INDEPENDENT AUDITOR'S RESPONSE:** As stated in our response under Recommendation 4, the audit report describes the benefits to the District from improved contract and change order management. Our audit report described opportunities for more implementation of change order processing, consistent documentation of the need for the changes, better review of pricing, etc. Enhancements to contract management for multi-million contracts were also identified. The RSO could help provide support to project managers for these activities, such as helping to prepare change orders, tracking change orders to ensure necessary approvals have been obtained, and in coordinating contract changes with the Procurement and Contracts Division.

RECOMMENDATION 6 - Promote the uniform implementation of change order management and administration for all capital projects by:

a) **Developing and establishing specific criteria for establishing contingency budgets for change orders that consider project complexity and size (Example: $0 contingency for capital projects less than $100,000 ranging to an amount over $1M for projects over $500M) eliminating the need for the Board of Directors to approve contingency budgets for each capital construction contract separately.**
b) **Updating the Quality and Environmental Management System (QEMS) forms to:**
   a. **Develop templates within the Capital Improvement Program Planning document to provide clarification on how Quality Records should be completed.**
   b. **Add a step in the Close-Out Checklist for the review of open change orders and potential change orders.**
   c. **Enhance the Risk Management Process document to include a review of similar projects in the Capital Improvement Program Historical Information Retrieval (CIPHIR) tool to identify additional project risks and corrective actions that may not have been previously identified.**
c) **Enhance project management training to address change order management and administration, including negotiation, pricing analysis, and contract closeout activities.**

AGENCY RESPONSE: Management disagrees with the recommendation. In the interest of transparency, contingency will continue to be separately approved by the Board of Directors for each capital construction contract. **Target Implementation**: N/A **AGENCY RESPONSE: Management agrees with the recommendation.** Regarding the recommendation to enhance the Risk Management Process: Providing a risk register and methods to mitigate risks, with reference to past projects, would assist Risk Management in defining insurance requirements. Large-scale projects will require a robust Risk Register with identified costs and methods to mitigate risks. Staff will develop the following: 1) A work instruction that lists those quality records to be included in the "official" contract file. Furthermore, a defined standard electronic folder system with a checklist of contents would accompany the work instruction and serve as a template for contract administration. 2) Staff will add additional details for the Close-out process that includes checklists and roles of the project manager, contract administration, and project controls. 3) A risk management approach and procedures. **Target Implementation**: December 2020 **a. AGENCY RESPONSE: Management agrees with the recommendation.** All Project Managers and Construction Management staff will be trained on essential project management skills to help ensure uniformity of practices on all projects. **Target Implementation**: December 2021	**INDEPENDENT AUDITOR RESPONSE:** The Independent Auditor acknowledges the importance of transparency and accountability in government. The intent of the recommendation is to reduce the financial risk of exceeding the original contract budget, which arises from the approval of the contingency budget in an open forum. Alternative processes can be implemented to minimize financial risk and accomplish the principles of transparency. For example, transparency may be accomplished by establishing specific policies, approved by the Board, that define the criteria for setting contingency budgets, such as project size, complexity, and procurement method (design-bid-build, design-build, etc.). The contingency budgets would then be established for projects according to the criteria.

RECOMMENDATION 7 - Develop, track, and report on performance metrics that monitor the timeliness, costs, and cost savings on large scale capital projects. Metrics established for monitoring the final capital project closeout costs against the original base contract amount should exclude contingency budget amounts.	
AGENCY RESPONSE: Management agrees with the recommendation. Management concurs with the recommendation to develop, track and report on performance metrics for all projects that have been included within our CIP. Performance metrics and key performance indicators (KPI's) will be created for monitoring, reporting requirements, and reporting methodology. **Target Implementation**: December 2021	**INDEPENDENT AUDITOR RESPONSE:** Valley Water's response satisfies the recommendation. Management should consider reducing the two-year timeframe for implementation so that it can demonstrate sooner the effectiveness of its efforts to improve the construction contract change order process.